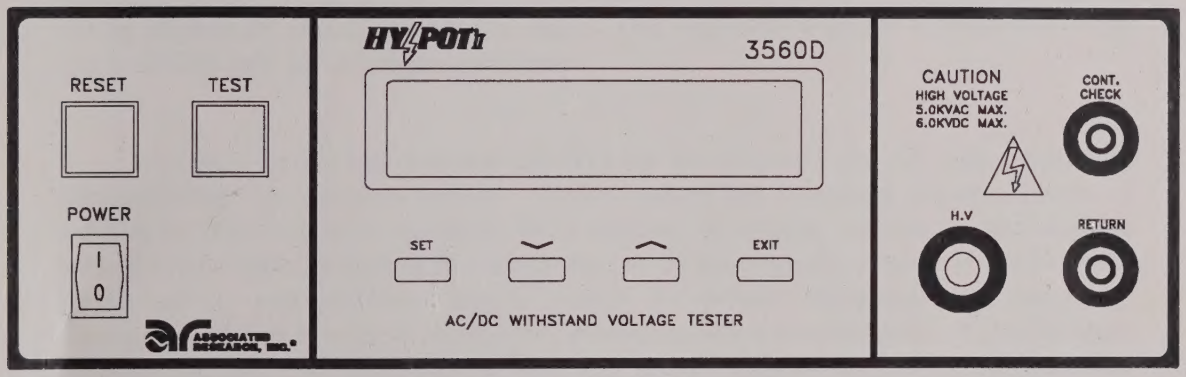
ASSOCIATED RESEARCH, INC.

OPERATION AND SERVICE MANUAL

MODEL 3500D (AC only)
3560D (AC and DC)



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FOR TECHNICAL ASSISTANCE
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Item # 37589

5 YEAR WARRANTY POLICY

Associated Research, Inc., certifies that the instrument listed in this manual meets or exceeds published manufacturing specifications. This instrument was calibrated using standards that are traceable to the National Institute of Standards and Technology (NIST).

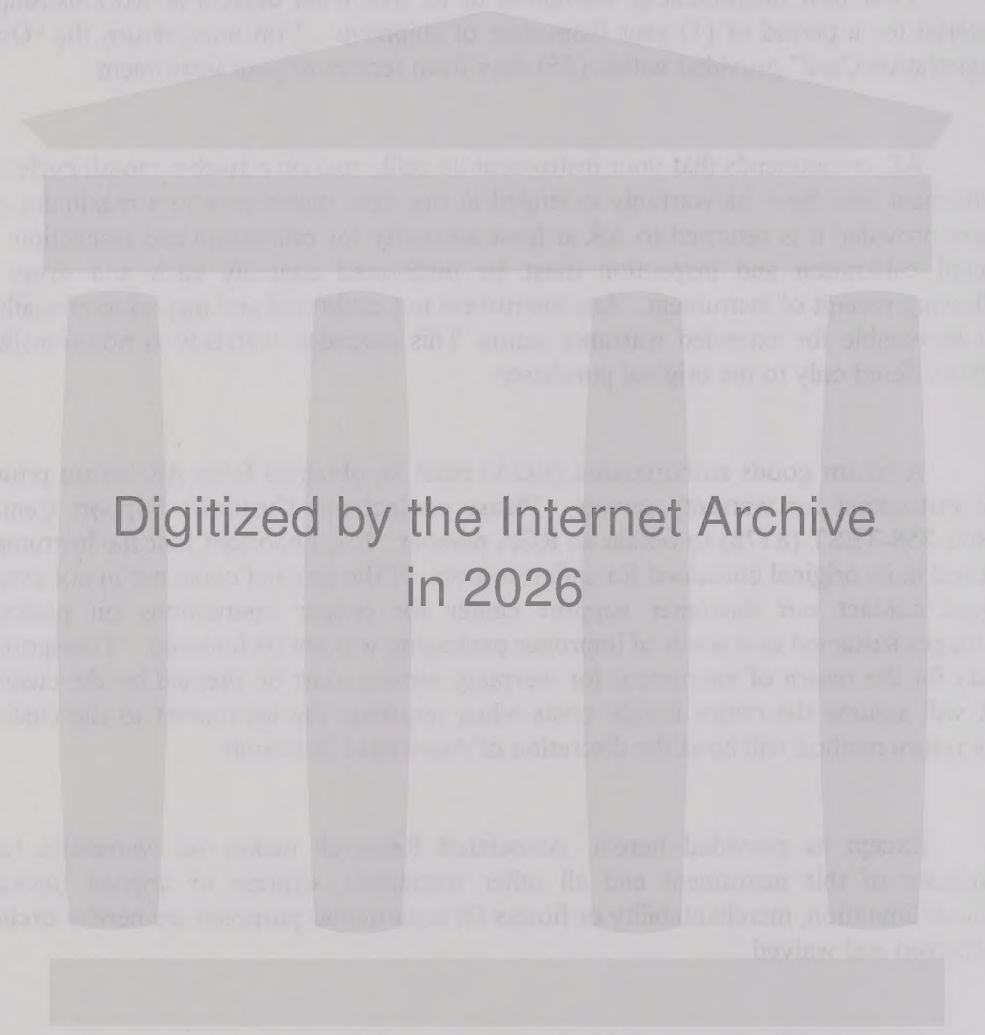
Your new instrument is warranted to be free from defects in workmanship and material for a period of (1) year from date of shipment. You must return the "Owners Registration Card" provided within (15) days from receipt of your instrument.

AR recommends that your instrument be calibrated on a twelve month cycle. This instrument may have its warranty extended in one year increments to a maximum of **(5) years** provided it is returned to AR at least **annually** for calibration and inspection. The annual calibration and inspection must be performed annually each and every year following receipt of instrument. Any instrument not calibrated and inspected annually will not be eligible for extended warranty status. This extended warranty is non-transferable and is offered only to the original purchaser.

A return goods authorization (RGA) must be obtained from AR before returning this instrument for warranty service. Please contact our Customer Support Center at 1-800-858-TEST (8378) to obtain an RGA number. It is important that the instrument is packed in its original contained for safe transport. If the original container in not available please contact our customer support center for proper instructions on packaging. Damages sustained as a result of improper packaging will not be honored. Transportation costs for the return of instrument for warranty service must be prepaid by the customer. AR will assume the return freight costs when returning the instrument to the customer. The return method will be at the discretion of Associated Research.

Except as provided herein, Associated Research makes no warranties to the purchaser of this instrument and all other warranties, express or implied (including, without limitation, merchantability or fitness for a particular purpose) are hereby excluded, disclaimed and waived.

Any non-authorized modifications, tampering or physical damage will void your warranty. Elimination of any connections in the earth grounding system or by-passing any safety systems will void this warranty. This warranty does not cover batteries or accessories not of Associated Research manufacture. Parts used must be parts that are recommended by AR as an acceptable specified part. Use of non-authorized parts in the repair of this instrument will void the warranty.



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OPERATION AND SERVICE MANUAL

Hypot ® II

MODEL 3500D (AC ONLY HIPOT WITH GROUND CONTINUITY CHECK)
MODEL 3560D (AC/DC HIPOT WITH GROUND CONTINUITY CHECK)

SERIAL NUMBER

	1	4	8	0	4	7	3

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905 Carriage Park Avenue, Lake Bluff, Illinois, 60044-2248 U.S.A.

Item# 37589

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SECTION 1
OPERATORS MANUAL

SAFETY PRECAUTIONS REQUIRED FOR HIGH VOLTAGE TESTING!

GENERAL:

This product and its related documentation must be reviewed for familiarization with safety markings and instructions before operation.

This product is a Safety Class I instrument (provided with a protective earth terminal).

Before applying power verify that the instrument is set to the correct line voltage (115 or 230) and the correct fuse is installed.

INSTRUCTION MANUAL SYMBOL. PLEASE REFER TO THE INSTRUCTION MANUAL FOR SPECIFIC WARNING OR CAUTION INFORMATION TO AVOID PERSONAL INJURY OR DAMAGE TO THE PRODUCT.

INDICATES HAZARDOUS VOLTAGES MAY BE PRESENT.

CHASSIS GROUND SYMBOL.

WARNING

CALLS ATTENTION TO A PROCEDURE, PRACTICE, OR CONDITION, THAT COULD POSSIBLY CAUSE BODILY INJURY OR DEATH.

CAUTION

CALLS ATTENTION TO A PROCEDURE, PRACTICE, OR CONDITION, THAT COULD POSSIBLY CAUSE DAMAGE TO EQUIPMENT OR PERMANENT LOSS OF DATA.

A Hipot produces voltages and currents which can cause **harmful or fatal electric shock.** To prevent accidental injury or death, these safety procedures must be strictly observed when handling and using the test instrument.

SERVICE AND MAINTENANCE

User Service
To prevent electric shock do not remove the instrument cover. There are no user serviceable parts inside. Refer servicing to an Associated Research, Inc. authorized service center. Schematics, when provided, are for reference only.

Service Interval
The instrument and its power cord, test leads, and accessories must be returned at least once a year to an Associated Research authorized service center for calibration and inspection of safety related components. Associated Research will not be held liable for injuries suffered if the instrument is not returned for its annual safety check and maintained properly.

User Modifications
Unauthorized user modifications will void your warranty. Associated Research will not be responsible for any injuries sustained due to unauthorized equipment modifications or use of parts not specified by Associated Research. Instruments returned to Associated Research with unsafe modifications will be returned to their original operating condition at your expense.

TEST STATION

Location
Select an area away from the main stream of activity which employees do not walk through in performing their normal duties. If this is not practical because of production line flow, then the area should be roped off and marked for **HIGH VOLTAGE TESTING**. No employees other than the test operators should be allowed inside.

If benches are placed back-to-back, be especially careful about the use of the bench opposite the test station. Signs should be posted: **"DANGER - HIGH VOLTAGE TEST IN PROGRESS - UNAUTHORIZED PERSONNEL KEEP AWAY."**

Power
Dielectric Voltage-Withstand Test Equipment must be connected to a good ground. Be certain that the power wiring to the test bench is properly polarized and that the proper low resistance bonding to ground is in place.
Power to the test station should be arranged so that it can be shut off by one prominently marked switch located at the entrance to the test area. In the event of an emergency, anyone can cut off the power before entering the test area to offer assistance.
Work Area
Perform the tests on a nonconducting table or workbench, if possible.

TEST PROCEDURES

!NEVER PERFORM A HIPOT TEST ON ENERGIZED CIRCUITRY OR EQUIPMENT!

If the instrument has an external safety ground connection be sure that this is connected. Then Connect the return lead **first** for any test regardless of whether the item under test is a sample of insulating material tested with electrodes, a component tested with the high voltage test lead, or a cord-connected device with a two or three prong plug.

Plug in the high voltage test lead only when it is being used. Handle its clip only by the insulator---**never touch the clip directly.** Be certain that the operator has control over any remote test switches connected to the Hipot. Double check the return and high voltage connections to be certain that they are proper and secure.

WARNING **NEVER TOUCH THE ITEM UNDER TEST OR ANYTHING CONNECTED TO IT WHILE HIGH VOLTAGE IS PRESENT DURING THE HIPOT TEST.**

When testing with DC, always discharge the capacitance of the item under test and anything the high voltage may have contacted--such as test fixtures--before handling it or disconnecting the test leads.

HOT STICK probes can be used to discharge any capacitance in the item under test as a further safety precaution. A hot stick is a nonconducting rod about two feet long with a metal probe at the end which is connected to a wire. To discharge the device under test, two hot sticks are required. First connect both probe wires to a good earth ground. Then touch one probe tip to the same place the return lead was connected. While holding the first probe in place, touch the second probe tip to the same place where the high voltage lead was connected.

KEY SAFETY POINTS TO REMEMBER:

- Keep unqualified and unauthorized personnel away from the test area.
- Arrange the test station in a safe and orderly manner.
- Never touch the product or connections during a test.
- In case of any problem, turn off the high voltage first.
- Properly discharge any item tested with DC before touching connections.

GLOSSARY OF TERMS

(as used in this manual)

Alternating Current, AC: Current which reverses direction on a regular basis, commonly in the U.S.A. 60 times per second, in other countries 50 times per second.

Breakdown: The failure of insulation to effectively prevent the flow of current, sometimes evident by arcing. If voltage is gradually raised, breakdown will begin suddenly at a certain voltage level. Current flow is not directly proportional to voltage. Once breakdown current has flown, especially for a period of time, a repeated application of voltage will often show breakdown beginning at a lower voltage than initially.

Conductive: Having a volume resistivity of no more than 10^3 ohm-cm or a surface resistivity of no more than 10^5 ohms per square.

Conductor: A solid or liquid material which has the ability to let current pass through it, and which has a volume resistivity of no more than 10^3 ohm-cm.

Current: The movement of electrons through a conductor. Current is measured in amperes, milliamperes, microamperes, nanoamperes, or picoamperes. Symbol = **I**

Dielectric: An insulating material which is positioned between two conductive materials in such a way that a charge or voltage may appear across the two conductive materials.

Direct Current, DC: Current which flows in one direction only. The source of direct current is said to be polarized and has one terminal which is always at a higher potential than the other.

Hipot Tester: Common term for dielectric-withstand test equipment.

Hypot®: Registered trademark of Associated Research, Inc., for its dielectric-withstand test equipment.

Insulation: Gas, liquid or solid material which has a volume resistivity of at least 10^{12} ohm-cm and is used for the purpose of resisting current flow between conductors.

Insulation Resistance Tester: An instrument or a function of an instrument capable of measuring resistance's in excess of 200 megohms. Usually employs a higher voltage power supply than used in ohmmeters measuring up to 200 megohms.

Leakage: AC or DC current flow through insulation and over its surfaces, and AC current flow through a capacitance. Current flow is directly proportional to voltage. The insulation and/or capacitance is thought of as a constant impedance, unless breakdown occurs.

Resistance: That property of a substance which impedes current and results in the dissipation of power in the form of heat. The practical unit of resistance is the *ohm*. Symbol = **R**

Trip Point: The minimum current flow required to cause an indication of unacceptable performance during a dielectric voltage-withstand test.

Voltage: Electrical pressure, the force which causes current through an electrical conductor. Symbol = **V**

INTRODUCTION

The importance of testing... User safety
In an era of soaring liability costs, original manufacturers of electrical and electronic products must make sure every item is as safe as possible. All products must be designed and built to prevent electric shock, even when users abuse the equipment or by-pass built in safety features.

To meet recognized safety standards, one common test is the "dielectric voltage-withstand test". Safety agencies which require compliance safety testing at both the initial product design stage and for routine production line testing include: Underwriters Laboratories, Inc. (UL), the Canadian Standards Association (CSA), the International Electrotechnical Commission (IEC), the British Standards Institution (BSI), the Association of German Electrical Engineers (VDE), the Japanese Standards Association (JSI). These same agencies may also require that an insulation resistance test and high current ground bond test be performed.

The Dielectric Withstand (Hipot) Test....
The principle behind a dielectric voltage - withstand test is simple. If a product will function when exposed to extremely adverse conditions, it can be assumed that the product will function in normal operating circumstances.

The most common applications of the dielectric-withstand test are:

- Design (performance) Testing.... determining design adequacy to meet service conditions.
- Production Line Testing.... detecting defects in material or workmanship during processing.
- Acceptance Testing.... proving minimum insulation requirements of purchased parts.
- Repair Service Testing.... determine reliability and safety of equipment repairs.

The specific technique varies with each product, but basically, during a dielectric voltage - withstand test, an electrical devise is exposed to a voltage significantly higher than it normally encounters. The high voltage is continued for a given period of time.

If, during the time the component is tested, stray current flow remains within specified limits, the device is assumed to be safe under normal conditions. The basic product design and use of the insulating material will protect the user against electrical shock.

The equipment used for this test, a dielectric-withstand tester, is often called a "hipot" (for high potential tester). The "rule of thumb" for testing is to subject the product to twice its normal operating voltage, plus 1,000 volts.

However, specific products may be tested at much higher voltages than 2X operating voltages + 1,000 volts. For example, a product designed to operate in the range between 100 to 240 volts, can be tested between 1,000 to 4,000 volts or higher. Most "double insulated" products are tested at voltages much higher than the "rule of thumb".

Testing during development and prototype stages is more stringent than production run tests because the basic design of the product is being evaluated. Design tests usually are performed on only a few samples of the product. Production tests are performed on each and every item as it comes off the production line.

The hipot tester must also maintain an output voltage between 100% and 120% of specification. The output voltage of the hipot must have a sinusoidal waveform with a frequency between 40 to 70 Hz and has a peak waveform value that is not less than 1.3 and not more than 1.5 times the root-mean-square value.

Advantages and Disadvantages of AC Testing and DC Testing....

Please check with the Compliance Agency you are working with to see which of the two type of voltages you are authorized to use. In some cases a Compliance Agency will allow either AC or DC testing to be done. However in other cases the Compliance Agency only allows for an AC test. If you are unsure which specification you must comply with please contact our **CUSTOMER SUPPORT GROUP at 1-800-858-TEST (8378).**

Many safety agency specifications allow either AC or DC voltages to be used during the hipot test. When this is the case the manufacturer must make the decision on which type of voltage to utilize. In order to do this it is important to understand the advantages and the disadvantages of both AC and DC testing.

AC testing characteristics

Most items that are hipot tested have some amount of distributed capacitance. An AC voltage cannot charge this capacitance so it continually reads the reactive current that flows when AC is applied to a capacitive load.

AC testing advantages

1. AC testing is generally much more accepted by safety agencies than DC testing. The main reason for this is that most items being hipot tested will operate at AC voltages and AC hipot testing offers the advantage of stressing the insulation alternately in both polarities which more closely simulates stresses the product will see in real use.

2. Since AC testing cannot charge a capacitive load the current reading remains consistent from initial application of the voltage to the end of the test. Therefore, there is no need to gradually bring up the voltage since there is no stabilization required to monitor the current reading. This means that unless the product is

sensitive to a sudden application of voltage the operator can immediately apply full voltage and read current without any wait time.

3. Another advantage of AC testing is that since AC voltage cannot charge a load there is no need to discharge the item under test after the test.

AC testing disadvantages

1. A key disadvantage of AC testing surfaces when testing capacitive products. Again, since AC cannot charge the item under test, reactive current is constantly flowing. In many cases the reactive component of the current can be much greater than the real component due to actual leakage. This can make it very difficult to detect products that have excessively high leakage current.

2. Another disadvantage of AC testing is that the hipot has to have the capability of supplying reactive and leakage current continuously. This may require a current output that is actually much higher than is really required to monitor leakage current and in most cases is usually much higher than would be needed with DC testing. This can present increased safety risks as operators are exposed to higher currents.

DC testing characteristics

During DC hipot testing the item under test is charged. The same test item capacitance that causes reactive current in AC testing results in initial charging current which exponentially drops to zero in DC testing.

DC testing advantages

1. Once the item under test is fully charged the only current flowing is true leakage current. This allows a DC hipot tester to clearly display only the true leakage of the product under test.

2. The other advantage to DC testing is that since the charging current only needs to be applied momentarily the output power requirements of the DC hipot tester can typically be much less than what would be required in an AC tester to test the same product.

DC testing disadvantages

1. Unless the item being tested has virtually no capacitance it is necessary to raise the voltage gradually from zero to the full test voltage. The more capacitive the item the more slowly the voltage must be raised. This is important since most DC hipots have failure shut off circuitry which will indicate failure almost immediately if the total current reaches the leakage threshold during the initial charging of the product under test.

2. Since a DC hipot does charge the item under test it becomes necessary to discharge the item after the test.

3. DC testing unlike AC testing only charges the insulation in one polarity. This becomes a concern when testing products that will actually be used at AC voltages. This is a key reason that some safety agencies do not accept DC testing as an alternative to AC.

4. When performing AC hipot tests the product under test is actually tested with peak voltages that the hipot meter does not display. This is not the case with DC testing since a sinewave is not generated when testing with direct current. In order to compensate for this most safety agencies require that the equivalent DC test be performed at higher voltages than the AC test. The multiplying factor is somewhat inconsistent between agencies which can cause confusion concerning exactly what equivalent DC test voltage is appropriate.

IF YOU SHOULD HAVE ANY QUESTIONS RELATING TO THE OPERATION OF YOUR INSTRUMENT CALL 1-800-858-TEST(8378) IN THE U.S.A.

Model 3500D and 3560D Functional Specifications

DIELECTRIC WITHSTAND TEST MODE

Unless otherwise stated, accuracies are relative to a laboratory standard measurement.

Descriptions	Specifications
INPUT VOLTAGE	115 / 230V selectable, ± 15 % variation 47 - 63 Hz
FUSE	115 VAC, 230VAC -- 2A fast acting 250VAC
OUTPUT	Rating AC 0 - 5000V, 2V / step, 12mA DC 0 - 6000V, 2V / step, 5mA (3560D only) Regulation : ± (1 % of output + 5V)
VOLTAGE SETTING	0V - Max output rating, 10 volts/step Accuracy : ± (2 % of Setting + 5V) (relative to displayed output) Can be adjusted during operation via UP and DOWN arrow keys.
OUTPUT FREQUENCY	Model 3500D : 50 / 60 Hz selectable 3560D : DC and 50 / 60 Hz selectable
WAVE FORM	Sinewave, Distortion : <2 % THD
RIPPLE	< 5 % at 6KVDC / 5mA (for model 3560D DC mode only)
DWELL TIME SETTING	0 and 0.2 - 999.9 seconds, 0.1 second / step "0" for continuous running Ramp = 0.1 seconds, fixed
FAILURE SETTINGS	AC mode High limit : 0.10 - 12.00 mA, 0.01 mA / step Accuracy : ± (2 % of setting + 0.02 mA) DC mode High limit : 0.02 - 5.00 mA, 0.01 mA / step Accuracy : ± (2 % of setting + 0.02 mA)
METERING	Voltmeter (4 digits) Range : AC 0.00 - 5.00 KV : DC 0.00 - 6.00 KV Resolution : .01 KV Accuracy : ± (2 % of reading + 10 V) Ammeter (4 digits) Range : AC 0.10 - 12.00 mA : DC 0.02 - 5.00 mA Resolution : 0.01 mA Accuracy : ± (2 % of reading + 0.02mA)

Descriptions	Specifications
TIMER DISPLAY	Range : 0.0 - 999.9 seconds Resolution : 0.1 second Accuracy : ± (0.1 % of reading + 0.05 seconds)
DISCHARGE TIME	≤ 300 ms The maximum capacitive load vs output voltage : 0.20 µF --- < 1KV 0.050 µF --- < 4KV 0.10 µF --- < 2KV 0.040 µF --- < 5KV 0.06 µF --- < 3KV 0.015 µF --- < 6KV
GROUND CONTINUITY CHECK	Current : DC 0.1 A ± 0.01A, fixed Max. ground resistance : 1 Ω ± 0.1Ω, fixed
REMOTE CONTROL AND SIGNAL OUTPUT	The following input and output signals are provided through the 9 pin D type connector; 1. Remote control : test and reset 2. Outputs : pass, fail and test in process
SECURITY	Lockout capability to avoid unauthorized access to test set-up program.
LINE CORD	Detachable 7 ft. (2.13m) power cable terminated in a three prong grounding plug.
TERMINATIONS	5ft.(1.52m) high voltage and return leads (2) with clips and a standard U.S. style (NEMA 5-15) remote receptacle box for testing items terminated with a line cord. International receptacles also available.
MECHANICAL	Tilt up front feet. Dimensions: (W x H x D) 11 x 3.5 x 14.56 in. (280 x 89 x 370 mm) Weight: 20 lbs (9 Kgs)
ENVIRONMENTAL	Operating Temperature : 32° - 113°F (0° - 45°C) Relative Humidity - 0 to 95%
CALIBRATION	Traceable to National Institute of Standards and Technology (NIST). Calibration controlled by software. Adjustments are made through front panel keypad in a restricted access calibration mode. Calibration information stored in non-volatile memory.

KEY FEATURES & BENEFITS OF Hypot II

1. No load setup of trip current and output voltage.
   This provides the operator with an easy and safe way to set trip currents and output voltages since parameters are set without the high voltage activated.

2. Automatic storage of test program.
   Hypot II powers up with the parameters that were used during the last test to avoid operator set-up errors.

3. All parameters for the setups can be adjusted through a simple menu driven program.
   The easy to follow setup screens ensure that the operator correctly sets up all test parameters.

4. Tamper proof front panel controls.
   This makes it possible to limit user access to the setup screens so that only authorized personnel with a security code can change test parameters.

5. Line and load regulation.
   This system maintains the output voltage to within 1% from no load to full load and over the line voltage range to ensure that test results remain consistent and within safety agency requirements..

6. The LCD display allows monitoring of current down to 100 microamps AC and 20 microamps DC.
   This allows the Hypot II to be used even when test requirements only allow a very low level of acceptable leakage current.

7. Electronic dwell settings.
   The electronic dwell control helps keep test results consistent by ensuring that the test duration is the same for each product tested.

8. PLC remote inputs and outputs.
   The standard 9 pin interfaces provide outputs for Pass, Fail, and Test in Process. Inputs include Test and Reset. This gives the user all the basic remotes required to configure the Hypot II through simple PLC relay control.

9. Front panel LCD displays test parameters and results.
   A front panel LCD allows the operator to monitor the test. The display holds the results after a test item failure so that the operator can easily review the test results. Indications of high fail and continuity failure are clearly displayed.

10. Maximum output current 12 milliamps AC and 5 milliamps DC.
    *This makes this instrument a **true** hipot tester with enough output current to test capacitive loads in AC mode and allows the instrument to comply with the UL "120 K ohm" requirements.*

11. Software calibration control.
    Hypot II is calibrated through the front panel keypad. All calibration information is stored in non-volatile memory. This allows Hypot II to be completely calibrated without removing any covers and exposing the technician to hazardous voltages.

12. User selectable output voltage frequencies of 50 or 60 hertz.
    Hypot II was designed for the global market. This feature makes it simple for the user to select the output frequency in the AC hipot mode so that products can be tested at the same frequency they will be used at.

13. Output voltage fine adjustment.
    To make Hypot II usable in all types of applications, the operator can manually bring the voltage up or down in 10 volt increments by simply pressing the up and down arrow keys. This makes it very easy to adjust the output voltage even while Hypot II is in the dwell mode so you can analyze test results at different voltages.

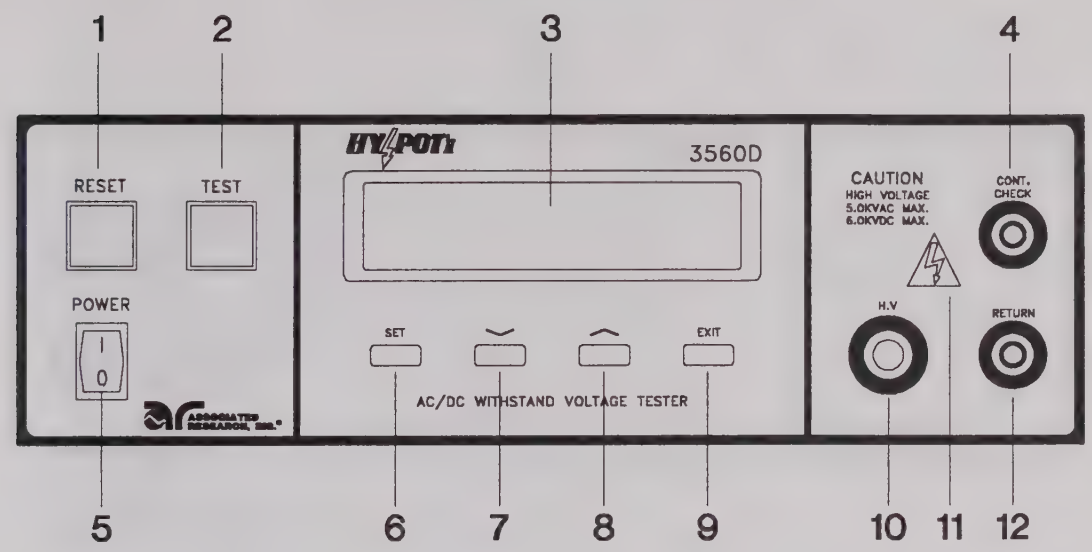
14. Built-in Continuity test mode.
    Hypot II meets ground continuity test requirements called out by UL and other safety agencies.

15. Flashing high voltage indicator.
    A flashing LED located directly over the high voltage terminal clearly indicates when high voltage is active to provide maximum operator safety.

16. Comes complete with a test box for products terminated in a line cord.
    The standard US style receptacle box allows easy testing of hipot and continuity on line cord terminated products. As an additional benefit, termination boxes are available for testing products with line cords configured for other countries.

17. User selectable input voltage.
    Hypot II can be switched for either 115 or 230 volt input operation through an easy access rear panel mounted switch to allow it to be used in any country.

FRONT PANEL CONTROLS



1. **RESET SWITCH:** This is a momentary contact switch. If out-of-range leakage current is detected during the hipot test or continuity failure occurs, the red Failure lamp within the switch will light. To reset the system for the next test, press and release this switch. This switch may also be used to abort a test in progress.

2. **TEST SWITCH:** This is a momentary contact switch. Press the green switch to turn on the high voltage output when in test mode. The Indicator lamp within the switch will light when continuity is "good", if continuity mode is enabled.

3. **LCD DISPLAY:** The Liquid Crystal Display is the main readout for the operator and programmer of the test settings and test results.

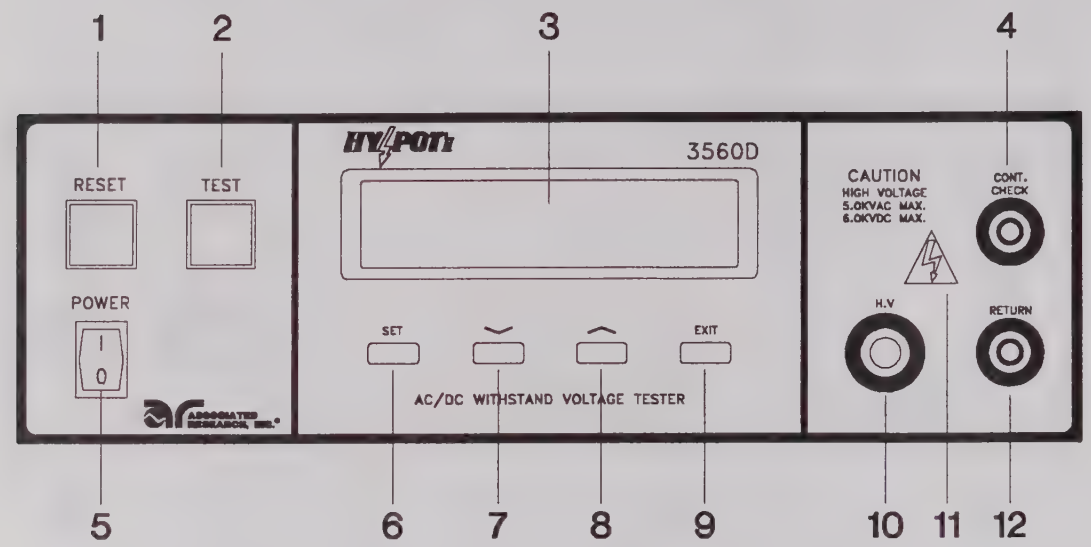
4. **CONTINUITY CHECK OUTPUT JACK:** For the connection of the detachable 5 foot (1.52 m) black return test lead. This lead is always used when performing a continuity test.

5. **POWER SWITCH:** Rocker-style switch with international ON (|) and OFF (0) markings.

6. **SET KEY:** Use this key to advance forward through the setup menus.

7. **DOWN ARROW (∨)**: Use this key to decrement numeric values in the setup mode. This key also used to toggle ON/OFF functions. Also may be used to decrease output voltage during a test in 10 volt increments.

FRONT PANEL CONTROLS



8. **UP ARROW (∧):** Use this key to increment numeric values in the setup mode. This key also used to toggle ON/OFF functions. Also may be used to increase output voltage during a test in 10 volt increments.

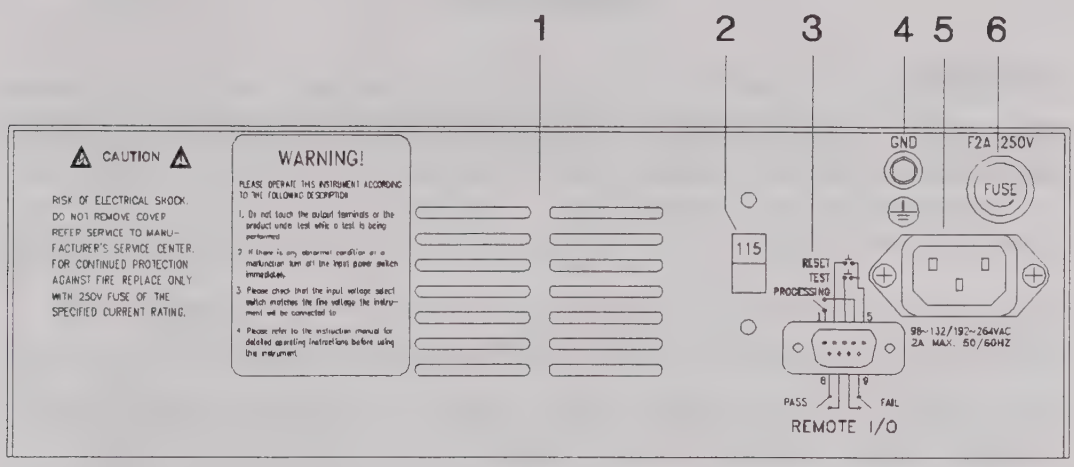
9. **EXIT KEY:** Use this key when you desire to enter the **Run Mode** to initiate a test.

10. **HIGH VOLTAGE OUTPUT JACK:** For the connection of the detachable 5 foot (1.52 m) red high voltage test lead. The silicone rubber insulation is flexible for easy handling and is rated at 30KVDC. The jack is recessed for safety when this lead is not being used.

11. **HIGH VOLTAGE ARROW (LED INDICATOR):** This indicator flashes to warn the operator that high voltage is present at the high voltage output terminal.

12. **RETURN OUTPUT JACK:** For the connection of the detachable 5 foot (1.52 m) black return test lead. This lead is always used when performing a test.

REAR PANEL CONTROLS



1. **THERMAL FAN:** To cool the instrument.

2. **INPUT POWER SWITCH:** Line voltage selection is set by the position of the switch. In the down position it is set for 115 volt operation, in the up position it is set for 230 volt operation.

3. **REMOTE INPUT/OUTPUT:** 9 pin D subminiature male connector for remote control of test and reset funtions as well as for monitoring PASS, FAIL, and PROCESSING output relay signals.

4. **CHASSIS GROUND (EARTH) TERMINAL:** This safety terminal should be connected to a good earth ground before operation.

5. **INPUT POWER RECEPTACLE:** Standard IEC 320 connector for connection to a standard NEMA style line power (mains) cord.

6. **FUSE RECEPTACLE:** To change the fuse unplug the power (mains) cord and turn the fuse cap counter clockwise to remove the fuse.

INSTALLATION

Introduction

This section contains information for the unpacking, inspection, preparation for use and storage of your Associated Research, Inc., product.

Unpacking and Inspection

Your instrument was shipped in a custom foam insulated container that complies with ASTM D4169-92a Assurance Level II Distribution Cycle 13 Performance Test Sequence.

If the shipping carton is damaged, inspect the contents for visible damage such as dents, scratches or broken meters. If the instrument is damaged, notify the carrier and the Associated Research customer support department immediately. Please save the shipping carton and packing material for the carriers inspection. Our customer support department will assist you in the repair or replacement of your instrument. Please do not return your product without first notifying us and receiving an RGA (return goods authorization) number.

Preparation for Use

Power Requirements and Line Voltage Selection

CAUTION This instrument requires a power source of either 115 volts AC ± 15%, 47-63 Hz single phase or 230 volts AC ±15%, 47-63 Hz single phase. Please check the rear panel to be sure the proper switch setting is selected for your line voltage requirements before turning your instrument on. In addition, please be sure the correct fuse is selected and installed while the instrument is in the off position.

Do not switch the line voltage selector switch located on the rear panel while the instrument is on or operating. This may cause internal damage and represents a safety risk to the operator.

NOTE

For operation at 115 Volts AC and 230 Volts AC use a 2A fast acting fuse.

Power Cable

WARNING

BEFORE CONNECTING POWER TO THIS INSTRUMENT, THE PROTECTIVE GROUND (EARTH) TERMINALS OF THIS INSTRUMENT MUST BE CONNECTED TO THE PROTECTIVE CONDUCTOR OF THE LINE (MAINS) POWER CORD. THE MAIN PLUG SHALL ONLY BE INSERTED IN A SOCKET OUTLET (RECEPTACLE) PROVIDED WITH A PROTECTIVE GROUND (EARTH) CONTACT. THIS PROTECTIVE GROUND (EARTH) MUST NOT BE DEFEATED BY THE USE OF AN EXTENSION CORD (POWER CABLE) WITHOUT A PROTECTIVE CONDUCTOR (GROUNDING).

This instrument is shipped with a three-wire power cable. When this cable is connected to an appropriate AC power source, this cable connects the chassis to earth ground. The type of power cable shipped with each instruments depends on the country of destination.

Operating Environment

This instrument may be operated in temperatures from 32° - 113° F
(0° - 45° C).
Relative humidity of 0 to 95%.
Altitude up to 15,000 feet (4,600 meters).

STORAGE AND SHIPMENT

Environment

This instument may be stored or shipped in environments with the following limits:

Temperature..... -40° to +75°C
Altitude..... 7,620 meters (25,000 feet)

The instrument should also be protected against temperature extremes which may cause condensation within the instrument.

Packaging

Original Packaging: Please retain all original packaging materials if you do not have an alternate method of repackaging. If you are returning your instrument to us for servicing please repackage the instrument in its original container or use an alternate packaging solution. Please do not reuse the original packing material if there appears to be damage or missing packing material. Contact our customer support department (1-800-858-8378) for an RGA (return goods authorization) number. Please enclose the instrument with all options, accessories and test leads. Indicate the nature of the problem or type of service needed. Also, please mark the container "FRAGILE" to insure proper handling. Upon receipt your instrument will be issued an AR service number. Please refer to this number in all correspondence.

Other Packaging: If you do not have the original packaging materials please follow these guidelines:

1). Wrap the instrument in a bubble pack or similar foam. Enclose the same information as above.

2). Use a strong double-wall container that is made for shipping instrumentation. 350 lb. test material is adequate.

3). Use a layer of shock-absorbing material 70 to 100 mm (3 to 4 inch) thick around all sides of the instrument. Protect the control panel with cardboard.

4). Seal the container securely.

5). Mark the container "FRAGILE" to insure proper handling.

6). Please ship models 3500D and 3560D via Federal Express or UPS air.

7). Please refer in all correspondence to your AR service number.

Field Installation Of Options

There are no field installable options on the model 3500D or 3560D.

QUICK START

This quick start guide assumes the operator has some familiarity with automated hipot testing and desires to use the **"default"** settings on the instrument. The default settings shown will remain in memory unless you choose to override them with your own test program. The instrument default settings are as follows:

DEFAULTS

- **Input Voltage:** 115 volts AC (rear panel switch selectable)
- **Voltage Output:** 1,240 volts AC
- **Current Trip:** HI-LMT: 10 mA
- **Dwell Timer:** 1 second
- **Voltage Type:** AC
- **AC Output Frequency:** 60Hz
- **Continuity:** OFF
- **Lock:** OFF

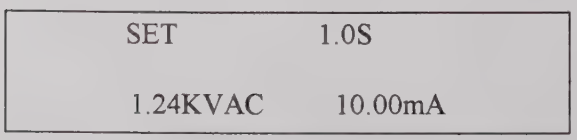
a). Unpack this instrument from its special shipping container. Be sure to save all packaging materials in case you need to return it to the factory for service.

WARNING b). Locate a suitable testing area and be sure you have read all safety instructions for the operation of the instrument and suggestions on the test area set-up in the SAFETY section of this manual. Locate a three prong grounded outlet. Be sure the outlet has been tested for proper wiring before connecting the instrument to it.

CAUTION c). Check to be sure the correct input line voltage has been selected on the rear panel. Either 115 volts AC or 230 volts AC. Connect the power input plug into its socket on the rear panel of the instrument. Connect the male end of the plug to the outlet receptacle.

Please be sure that the safety ground on the power line cord is not defeated and that you are connecting to a grounded power source.

d). Turn on the POWER switch located on the lower left hand side of the front panel. Upon powering the instrument up a POWER ON SELF TEST (POST) will automatically be performed. This test will check for the condition of the ram chips, led indicators, pcb's and other critical components. All of the front panel led's will light temporarily then go out. In addition, you will see the Associated Research name and Model Number briefly appear on the LCD readout and then clear itself.



You should then see the default parameters on the LCD meter as follows:

These abbreviated parameters stand for the following:

SET:	This is the parameter settings review screen.
1.0 S:	The dwell timer is set to a test duration of 1 second.
1.24KVAC:	The test voltage is set to 1,240 volts AC.
10.00 mA:	The high leakage current trip point is set to 10 milliamps.

If you wish to not use any one of these parameters you must change your parameters. Please refer to the Operation Instructions section in this manual for further details.

e). If the instrument defaults are acceptable then be sure to connect the appropriate test leads to the device under test (DUT) or test fixture. Be sure to connect this safety ground to a suitable known good ground before energizing this instrument, Then connect the return lead first (black) to the test fixture or item followed by the high voltage output lead (red).

WARNING f). Please check your connections to be sure they are making good contact and that the test station or area is clear of debris and other personnel. DO NOT TOUCH THE DEVICE UNDER TEST ONCE THE TEST HAS BEEN STARTED. To initiate the test press the GREEN test button on the front panel. This is a momentary button and does not need to be held in the pressed position during the test. The instrument will then cycle ON and begin the automated test sequence using the defaults. If a failure occurs you will HEAR an audible alarm go off. To stop the alarm you must depress the RED button marked RESET. This will silence the alarm and reset the instrument to begin another test. This RESET button may also be used as a safety button to quickly ABORT a test and cut off the HIGH VOLTAGE.

When HIGH VOLTAGE is present a RED flashing indicator located above the HV receptacle will remain flashing until the HIGH VOLTAGE is OFF. If the device under test PASSED the test then no audible alarm will sound. You will hear a brief BEEP to let you know the item was successfully tested and it PASSED. In the case of a FAIL condition the instrument will provide a memory of the test condition results on the LCD display that will remain until the next test is initiated. Depressing the reset button will reset the instrument alarm while keeping the last test results on the display. Depressing the reset button a second time will clear the display.

OPERATION INSTRUCTIONS FOR Hypot II
Model 3500D and 3560D

A. POWER UP:

CAUTION Check to be sure the correct input line voltage has been selected on the rear panel. Either 115 volts AC or 230 volts AC. Connect the power input plug into its socket on the rear panel of the instrument. Connect the male end of the plug to the outlet receptacle.

Please be sure that the safety ground on the power line cord is not defeated and that you are connecting to a grounded power source. Also connect the rear panel chassis ground for additional safety.

Turn on the POWER switch located on the lower left hand side of the front panel. Upon powering the instrument up a POWER ON SELF TEST (POST) will be automatically performed. This test will check for the condition of the ram chips, pcb's and other critical components. In addition the display will show the following message.

ARI HYPOT II 3500D VER: X.X	or	ARI HYPOT II 3560D VER: X.X

The instrument will recall the last setup which was active and the display will show the parameters which were programmed into the unit. The instrument is now ready for operation.

B. SETUP PROCEDURE:

1. To set the AC / DC mode for MODEL 3560D

Press the SET key until the display shows:

Mode = AC	or	Mode = DC

Press the Up or Down Arrow keys to toggle the output function; AC or DC, then press the EXIT key to exit to the test mode or toggle to another setting using the SET key.

2. To set the Output Test Voltage

Please press the SET key until the display shows:

Voltage = X.XX KV

Please use the Up/Down Arrow keys to enter the desired test voltage, then press the EXIT key to exit to the test mode or toggle to another setting using the SET key. The maximum voltage which may be entered is 5000 volts AC or 6000 volts DC.

3. To set the High Leakage Current Limit
Please press the SET key until the display shows:

HI-LMT= XX.XX mA

Use the Up/Down Arrow keys to enter the leakage current high limit setting, then press the EXIT key to to exit to the test mode or toggle to another setting using the SET key. The unit of measure is in milliamperes with 0.10 AC and 0.02 DC milliamperes as the minimum setting.

4. To set the Dwell Time
Please press the SET key until the display shows:

Timer = XXX.X s

Use the Up/Down Arrow keys to enter the dwell time setting, then press the EXIT key to exit to the test mode or toggle to another setting using the SET key. If the dwell time is set to "0", the instrument will operate in a continuous ON mode when the test button is depressed and released. It will stop when the DUT (Device Under Test) goes into failure or the manual reset button is pressed. The minimum dwell time setting is 0.5 seconds with 0.1 second resolution.

5. To setup the Ground Continuity Check
Please press the SET key until the display shows:

Continuity = ON	or	Continuity = OFF

Press the Up/Down Arrow key to select the "ON" or "OFF" function of the Ground Continuity Check mode, the display will show the set status immediately.
Press the EXIT key to to exit to the test mode or toggle to another setting using the SET key.

If the Continuity Function is set to "ON" , the Ground Continuity cable has to be connected between the "Cont. Check" connector on the instrument panel and the chassis of the DUT. The instrument will test the ground connection of the DUT automatically. If continuity is present a green indicator will be illuminated on the TEST switch and the operator may proceed with the hipot test. The Hypot II will continue to test the ground

connection of the DUT during other tests. If no continuity is present while the operator tries to initiate a test, the instrument will signal a continuity failure.

6. To lock or unlock the front panel keyboard
The Hypot II is equipped with a lockout mode. Within this mode you can lockout all front panel control functions except TEST and RESET.

Please refer to the Calibration Procedures in the Service Section of this manual for further details.

7. To set the Frequency 50/60 Hz
Please refer to the Calibration Procedures in the Service Section of this manual for further details.

C. OPERATING PROCEDURES:

1. If the instruments defaults are acceptable then be sure to connect the appropriate test leads to the device under test (DUT) or test fixture. Be sure to connect the safety ground (on the rear panel) to a suitable known good ground before energizing this instrument. Then connect the return lead first to the test fixture or the DUT followed by the high voltage lead.

WARNING Check your connections to be sure they are making good contact and that the test station or area is clear of debris or other personnel. **DO NOT TOUCH THE DEVICE UNDER TEST ONCE THE TEST HAS BEEN STARTED.**

2. If you are performing a Ground Continuity Check the Ground Continuity must be set to the "ON (Enabled)" position. The ground check cable has to be connected properly to the chassis of the DUT and the green indicator on the TEST switch should be illuminated before activating the Test switch. Otherwise, the instrument will signal a *continuity failure* when the test switch is activated.
The display will show:

```
CONT-Fail.      0.0s
-.--KVAC     --.--mA
```

If you are not performing a Ground Continuity Check the Ground Continuity must be set to the "OFF" (Disabled) position. It is not necessary to connect the "Cont.Check" cable since this test will not be performed if the circuit is disabled. The instrument will proceed with the Hipot Test when the "Test" switch is activated.

3. Please follow the setup procedures to set the parameters. The display will show the time of "Dwell", value of "Test Voltage" and the value of the "High Limit Leakage Current" as follows:

```
Set             XXX.Xs
X.XXKVAC XX.XXmA
```

4. To initiate a test press the TEST switch on the front panel. The red High Voltage Arrow indicator will flash and the display will immediately show:

```
Testing         XXX.Xs
X.XXKVAC  XX.XXmA
```

The instrument will continue to output the set dwell voltage for the duration of the selected dwell time.

5. If there is a short circuit in the DUT during the test, the red indicator light will illuminate on the RESET switch and an alarm will sound. The display will show:

```
HI-FAIL     XXX.Xs
X.XXKVAC  OFL  mA
```

6. If a flash over occurs in the DUT during the test, which results in an OFL condition due to the current exceeding the maximum metering range, Breakdown will be indicated as follows. The red indicator light will illuminate on the RESET switch and an alarm will sound. The display will show:

```
HI-FAIL     XXX.Xs
X.XXKVAC  OFL  mA
```

7. If the leakage current exceeds the metering range and neither a short circuit nor flash over occurred, the red indicator light will illuminate on the RESET switch and an alarm will sound. The display will show:

```
HI-FAIL     XXX.Xs
X.XXKVAC  OFL  mA
```

8. If the leakage current exceeds the high limit setting, but does not exceed the metering range, the red indicator light will illuminate on the RESET switch and an alarm will sound. The display will show:

```
HI-FAIL     XXX.Xs
X.XXKVAC  XX.XX mA
```

9. To stop the alarm, please press the RESET switch once. The alarm will stop and the display will retain the failure information. If the RESET switch is pressed again, the data on the display screen will be cleared and the display will indicate the setting data from the last test. The instrument is now ready for the next test.

10. If the DUT passed all of the tests, the instrument will output a short audible beep tone to indicate the DUT has passed the tests. The display will show:

```
Pass              XXX.Xs
X.XXKVAC  XX.XXmA
```

The instrument is now ready to perform another test.

11. If the operator elects to abort a test in process this can be accomplished by pressing the RESET switch at anytime. The instrument will stop the test process immediately and the display will show:

```
Abort             XXX.Xs
X.XXKVAC  XX.XXmA
```

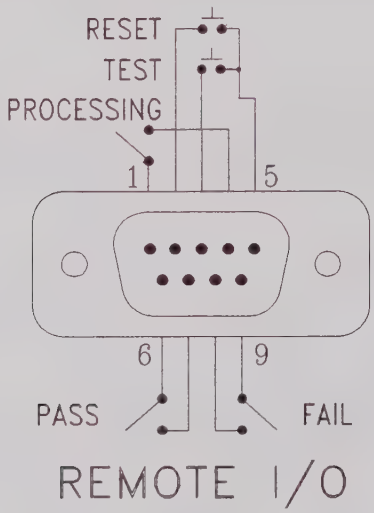
Please press the TEST switch to initiate another test.

D. CONNECTION OF REMOTE I/O:

A 9 pin "D" type connector is mounted on the rear panel which provides REMOTE-INPUT-OUTPUT control and information. This connector mates with standard 9 pin "D" subminiature connector provided by the user. The Remote I/O mates to a female (receptacle) connector. For best performance a shielded cable should be used. To avoid ground loops the shield should not be grounded at both ends of the cable. Suggested AMP part numbers for interconnecting to the Remote I/O are shown below.

205203-3	RECEPTACLE SHELL
745253-7	CRIMP SNAP-IN SOCKET CONTACT (for receptacle)
745171-1	SHIELDED CABLE CLAMP (for either plug or receptacle)
747784-3	JACKSCREW SET (2)

REMOTE INTERFACE REAR PANEL:



1. SIGNAL OUTPUTS ON REMOTE I/O

The rear panel connector provides output signals to remotely monitor PASS, FAIL, and PROCESSING conditions. These signals are provided by three normally open internal relays that switch on to indicate the current condition of the tester. These are normally open free contacts and will not provide any voltage or current. The ratings of the contacts are 1A / 250 VAC (0.5 ADC). Below is a listing that indicates what conditions activate each pin. When a terminal becomes active the relay closes thereby allowing the external voltage to operate an external device.

Pins 6 and 7 provide the PASS signal.
Pins 8 and 9 provide the FAIL signal.
Pins 1 and 4 provide the PROCESSING signal.

The following describes how the relays operate for each test condition.

PROCESSING - The relay contact closes the connection between pin (1) and pin (4) while the instrument is performing a test. The connection is opened at the end of the test.

PASS - The relay contact closes the connection between pin (6) and pin (7) after detecting that the item under test passed all tests. The connection is opened when the next test is initiated or the reset function is activated.

FAIL - The relay contact closes the connection between pin (8) and pin (9) after detecting that the item under test failed any test. The connection is opened when the next test is initiated or the reset function activated.

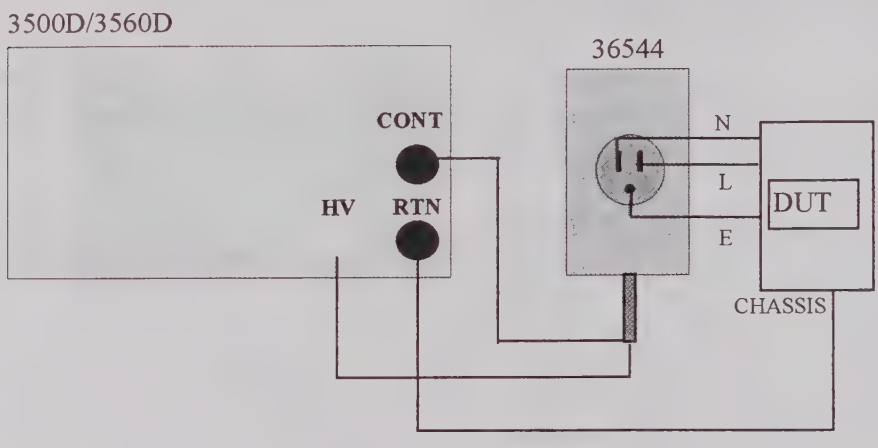
2. SIGNAL INPUTS OF REMOTE I/O

The Hypot II remote connector enables remote operation of the TEST and RESET functions. A normally open momentary switch can then be wired across pins 3 and 5 to allow remote operation of the TEST function. A normally open momentary switch can also be wired across pins 2 and 5 which allows remote operation of the RESET function. For safety the front panel RESET switch remains active even when a remote reset switch is connected so that high voltage can be shut down from either location.

CAUTION DO NOT CONNECT VOLTAGE OR CURRENT TO THE SIGNAL INPUTS, THIS COULD RESULT IN DAMAGE TO THE CONTROL CIRCUITRY.

E. ADAPTER BOX CONNECTION:

The following diagram shows how to connect the adapter box to the HYPOT II and to the device under test.



Test Connections

The adapter box allows you an easy way to connect an item which is terminated in a two or three prong line cord. If you are testing a product which is terminated in a three prong plug, you are also required to perform a continuity or ground bond test on the ground conductor of the DUT to the chassis or dead metal of the product. With the HYPOT II, you can perform both the hipot and continuity tests at the same time by activating the continuity function on the instrument.

When the HYPOT II tests the ground conductor of the line cord, if the resistance of the ground conductor exceeds 1Ω, the hipot will signal a continuity failure. If continuity is present, high voltage is applied to both conductors of the line cord to insure that all current carrying conductors in the primary circuit are tested. When testing products with two prong plugs, do not activate the continuity circuit.

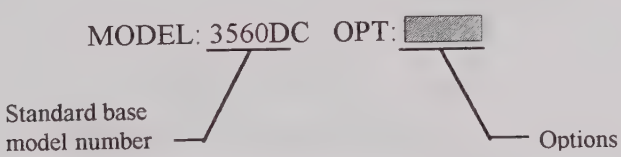
MODEL 3500D/3560D OPTIONS

Introduction

This section contains a list and descriptions of available factory installed options at the time of this printing. The list of options contains an option code number which can be referenced on the model option label on the rear panel of the unit when options are present.

Model Option Label

The option code is contained in the OPT field. The complete model number will include the standard base model number and end with the letter "C".



For example, your model option label would appear as follows:

fitted with option 02 ..... MODEL: 3500DC OPT: 02

fitted with option 01 and 03 ..... MODEL: 3560DC OPT: 0103

3500D/3560D Options

Option List

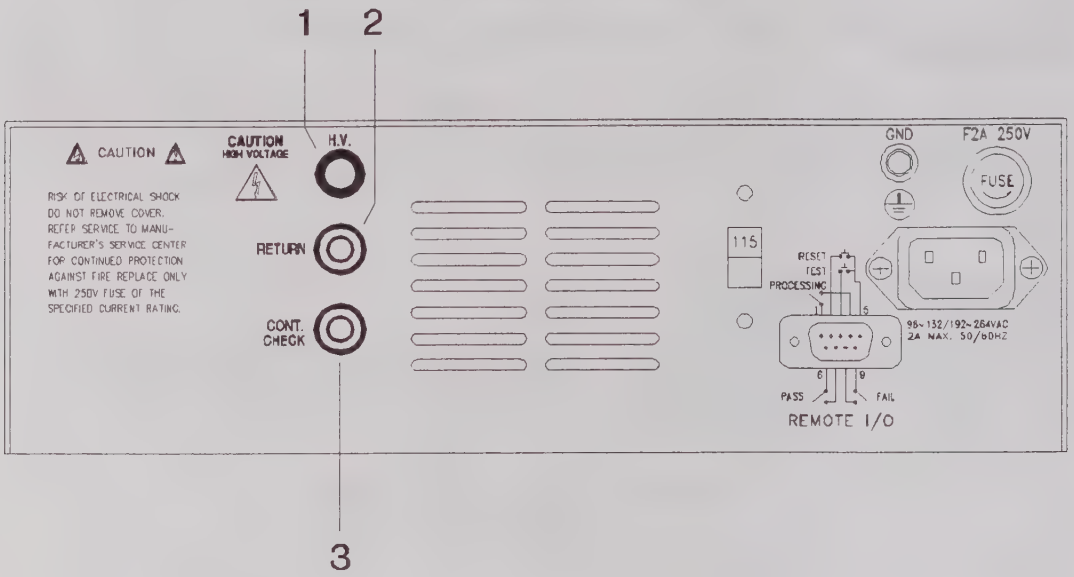
Code	Description
01	Rear Outputs
02	TBA
03	TBA

Description

01 Rear Outputs

The Rear Outputs option gives the user the capability to access the High Voltage, Return and Continuity outputs from the rear panel for use in automated systems. The configuration and descriptions are as follows.

OPTIONAL REAR PANEL CONTROLS



1. **HIGH VOLTAGE OUTPUT JACK:** For the connection of the detachable 5 foot (1.52 m) red high voltage test lead. The silicone rubber insulation is flexible for easy handling and is rated at 30KVDC. The jack is recessed for safety when this lead is not being used.

2. **RETURN OUTPUT JACK:** For the connection of the detachable 5 foot (1.52 m) black return test lead. This lead is always used when performing a test.

3. **CONTINUITY CHECK OUTPUT JACK:** For the connection of the detachable 5 foot (1.52 m) return test lead. This lead is always used when performing a continuity test.

SECTION 2
SERVICE MANUAL

CALIBRATION PROCEDURES

This instrument has been fully calibrated at the factory in accordance to our published specifications. It has been calibrated with standards traceable to NIST. You will find in this manual a copy of the "Certificate of Calibration". It is recommended that you have this instrument recalibrated and a safety check done at least once per year. AR recommends you use "Calibration Standards" that are NIST traceable, or traceable to agencies recognized by NIST to keep this instrument within published specifications. End user metrology standards or practices may vary. These metrology standards determine the measurement uncertainty ratio of the calibration standards being used.

Calibration Equipment Required:
The following equipment will be needed to properly calibrate your instrument.

1). Digital Multimeter with the minimum ranges;
AC Voltage: 5,000 volts
AC Current: 25mA range.

2). 500KΩ/50Watt resistor

CALIBRATION PROCEDURE:

To enter the calibration mode the instrument must be in the OFF position. Press and hold the EXIT key, then turn on the Input Power Switch. The display will show:

```
CAL Mode EXIT:Hz
SET:V  v:A  ^:Lock
```

Press the SET key for kilovolts calibration, Down Arrow key (v) for milliamps, the Up Arrow key (^) for lock mode settings, and the EXIT key to change output frequency.

1. Calibration of Voltage
Equipment needed: STANDARD AC VOLTMETER capable of measuring 5000VAC.

Please connect a standard ac voltmeter with 5000V minimum full scale range to the high voltage and return connectors.
Then press the SET key on the front panel. The instrument will provide around 5000VAC on the output connectors and the display will show:

```
Voltage =__          V
```

Please use the Up/Down Arrow keys to enter the reading off the AC Voltmeter into the instrument. Then press the SET key to store the voltage setting. Press the EXIT or RESET key to return to the calibration menu without changing the calibration setting.

The instrument will output two short "beeps" when attempting to save a missing or bad parameter and will not allow return to the calibration menu.

2. Calibration of Current

Equipment needed: STANDARD AC MILLIAMMETER with a range of 25mA and a fixed Resistor 500K Ohms, 50 watts.

Please connect a 500KΩ resistor in series with the standard ac milliammeter and connect these across the output leads of the instrument. Press the Down Arrow key. The instrument will provide around 5000VAC on the output and the display will show:

Current =__ mA

Please use the Up/Down Arrow keys to enter the reading of the standard AC milliammeter into the instrument. Then press the SET key to store the current setting. Press the EXIT or RESET key to return to the calibration menu without changing the calibration setting.

The instrument will output two short "beeps" when attempting to save a missing or bad parameter and will not allow return to the calibration menu.

3. Frequency

Please press the EXIT key, the program will enter automatically to the Frequency Selection mode and the display will show:

Freq = 50HZ

or

Freq = 60HZ

Please use the Up or Down Arrow keys to select the output frequency and then press the EXIT key or RESET button to store the setting and return to the calibration menu.

4. Lock Mode

The lock funtion can be set to "ON" or "OFF". Please press the Up Arrow key, the program will enter the LOCK SELECTION mode and the display will show:

Lock = ON

or

Lock = OFF

Please use the Up or Down Arrow keys to select the lock mode and then press the EXIT key or RESET button to store the setting and return to the calibration menu.

5. Save Calibration

After the calibration, the instrument has to be turned off to save the calibration parameters. The power must be turned off and on again to switch from the calibration mode to the run mode.

Replacement Parts List HYPOT II

Model 3500D 3560D

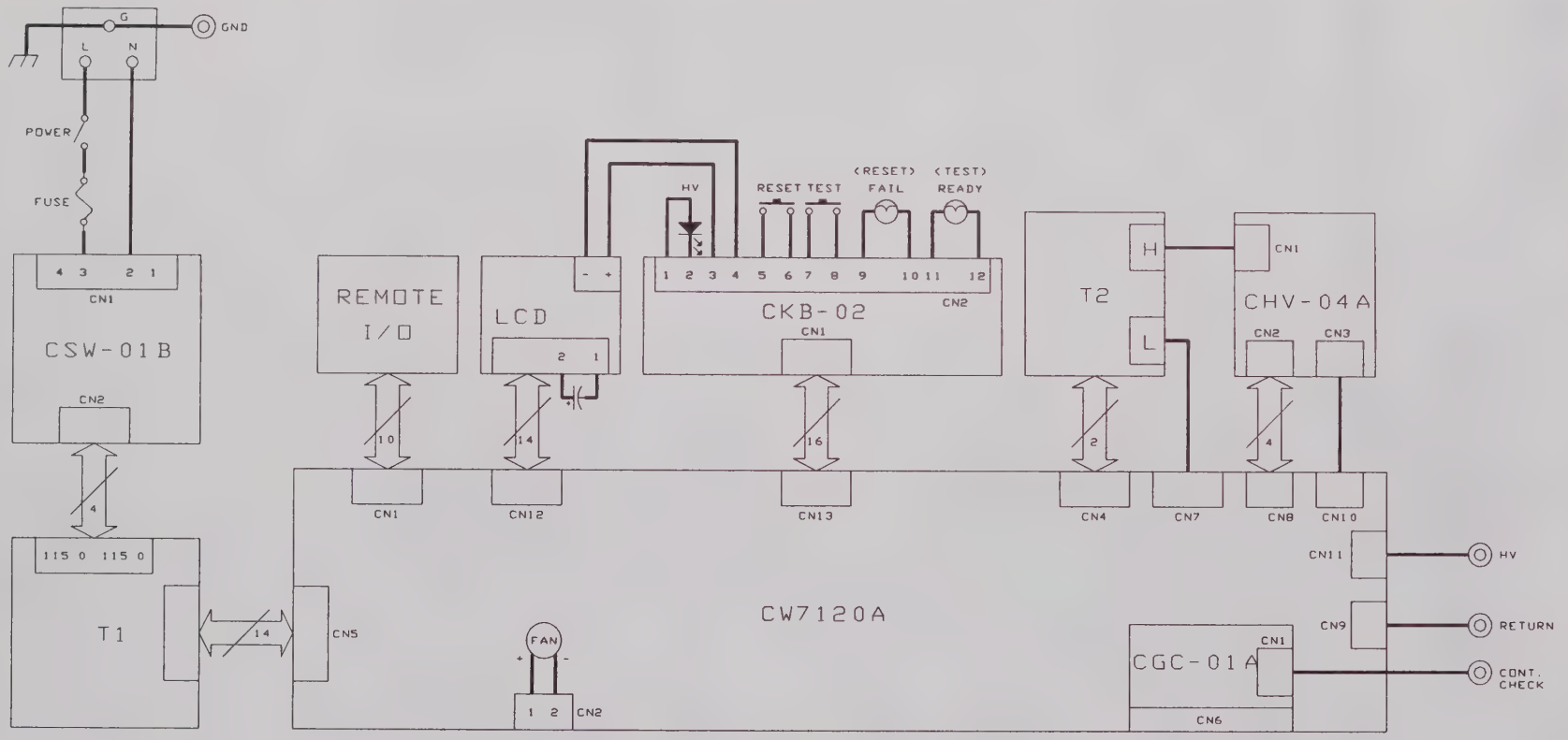
Rev. A 5/13/96 ECO 4614

Part Number	Qty.	Reference Designator	Description
37548	1	CGC-01A	Ground Continuity Check Board Rev. A
37590	1	CHV-04	High Voltage Control Board (3560D only)
37593	1	CKB-02	Key Board Assembly
37515	1	CSW-01B	Input Protection Board Rev. B
37592	1	CW7120	Main Control Board
37571	1	-	Earth Connector
35999	4	-	Black Banana Jacks
37478	2	-	High Voltage Connector
37599	1	-	Feet kit
37600	1	-	Fuse 2A 250V fast acting 30mm UL Listed
37493	1	-	Fuse Holder 30mm UL Listed
37554	1	-	LCD Display 16 x 2 Characters
37555	1	-	Power Switch 2P 10A/250V
37673	1	-	Test Switch, Green
37497	1	-	Reset Switch, Red
37601	1	T2	Output High Voltage Transformer
37602	1	T1	Input Transformer
33189	1	-	Input Power Cable 10A/7Ft.
04040A-08	1	-	High Voltage Output cable
02100A-13	2	-	Return cable
37487	3	Q1-Q3	Power Transisitors D1148
37565	1	RY2	Relay Gunther 3392-1270-246
37603	1	IC29	12 Bit D/A Converter 7541
37676	1	IC36	Microcontroller 8 Bit P87C52
37569	1	IC11	8 Bit D/A Converter DAC 0800
37604	1	RY1	Relay Gunther 3390-1270-246
37605	2	FAIL,READY	Bulbs

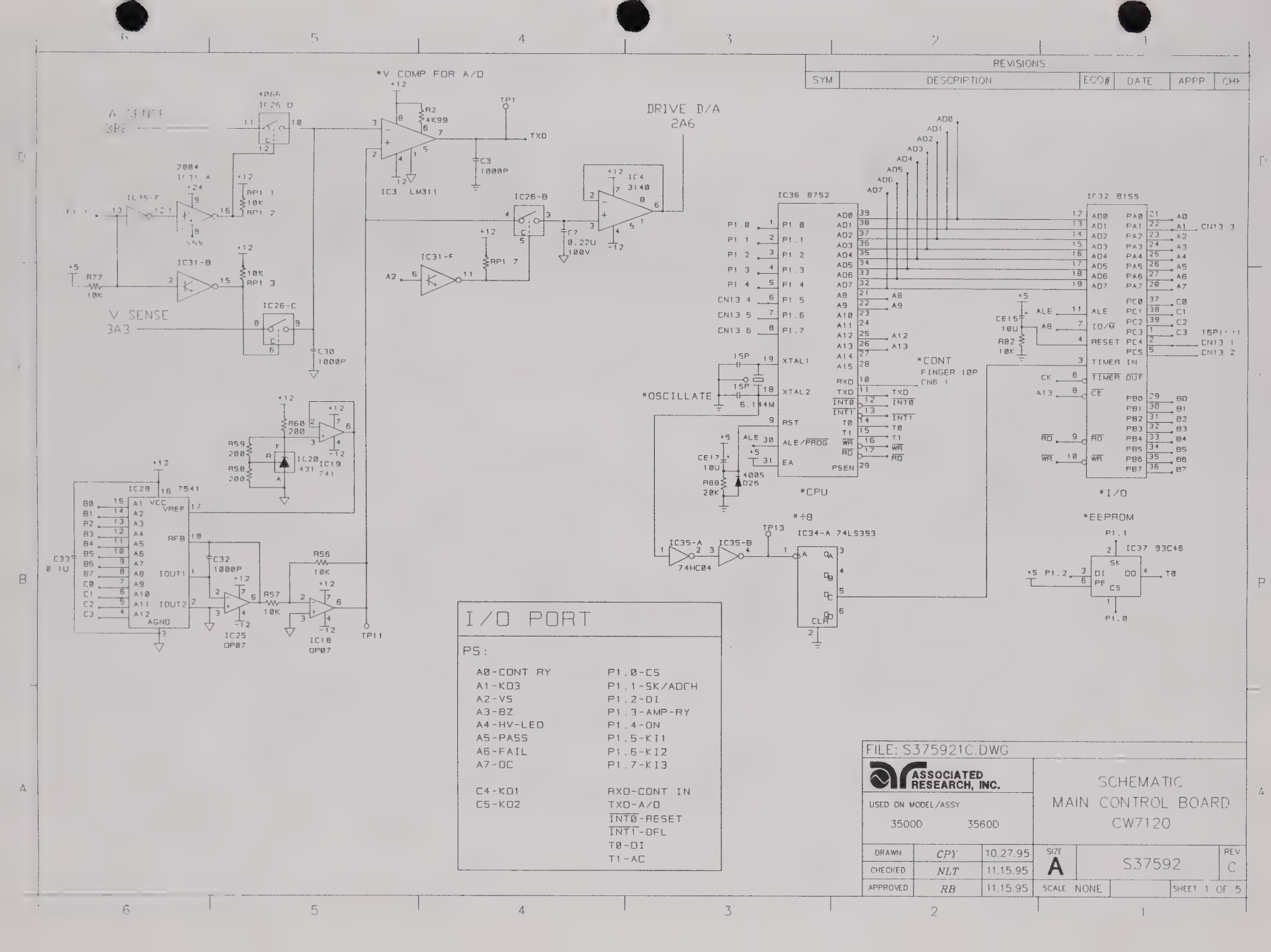
SCHEMATIC INDEX

Drawing Number	Description	Pages
S03500D	Wiring Diagram	1
S37592	Main Control Board	5
S37548	Ground Continuity Check Board	1
S37590	HV Control Board AC/DC	1
S37593	Keypad Board	1
S37515	Input Protection Board	1

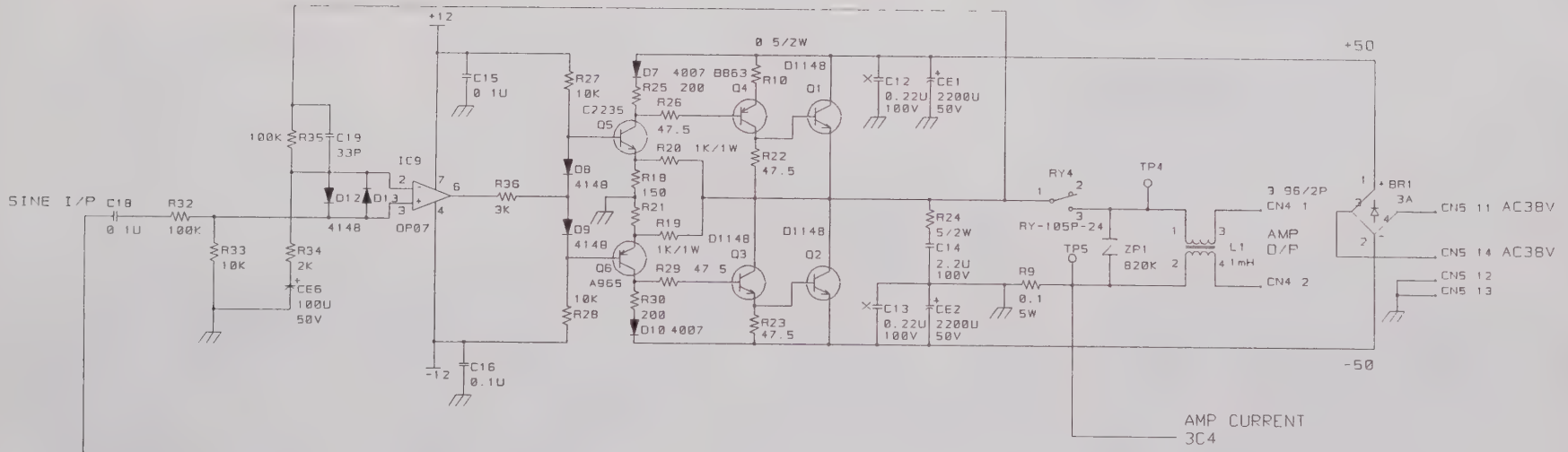
REVISIONS					
SYM	DESCRIPTION	ECO#	DATE	APPR	CHK

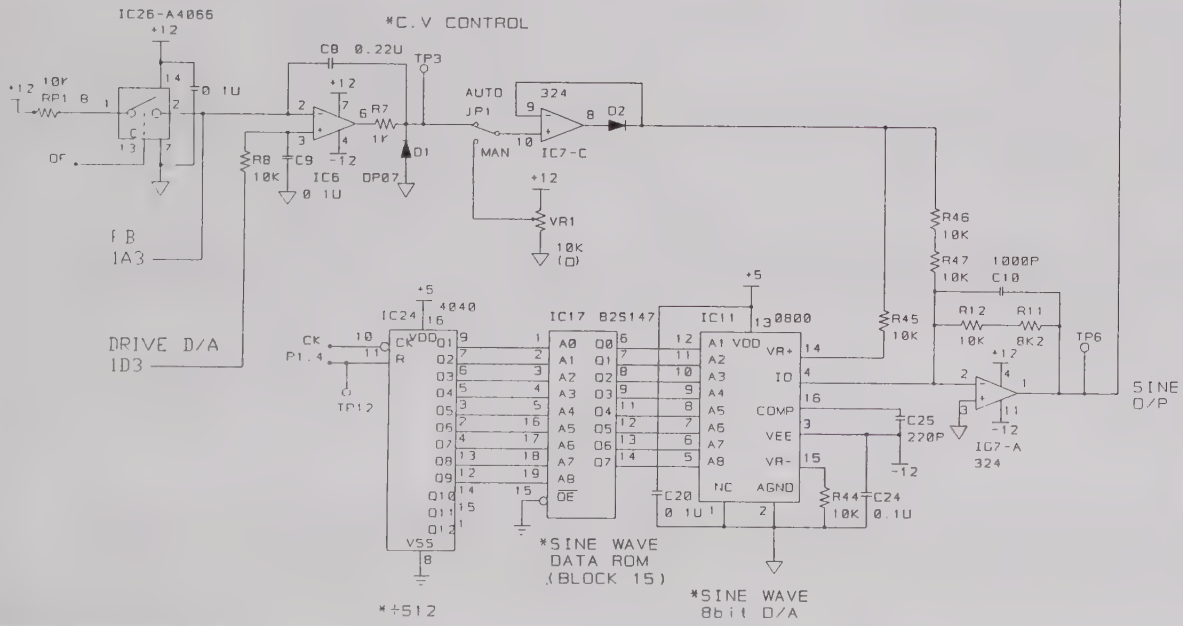


FILE: S3500D.DWG				
ASSOCIATED RESEARCH, INC.			SCHEMATIC 3500D/3560D WIRING DIAGRAM	
USED ON MODEL/ASSY: 3500D 3560D				
DRAWN	CPY	11.06.84	SIZE A	S03500D REV –
CHECKED	NJT	11-15-84		
APPROVED	RB	11/15/84	SCALE NONE	SHEET 1 OF 1


REVISIONS
SYM | DESCRIPTION | ECO# | DATE | APPR | CHK
*V COMP FOR A/D
DRIVE D/A
2A6
A SENSE
3B5
V SENSE
3A3
IC3 LM311
IC4 3140
IC26-B
IC26-C
IC31-A
IC31-B
IC31-F
IC35-F
IC36 8752
IC32 8155
*CPU
*I/O
*EEPROM
*OSCILLATE
*CONT FINGER 10P
*÷8
IC34-A 74LS393
IC35-A 74HC04
IC35-B
IC29 7541
IC20 431
IC19 741
IC25 OP07
IC18 OP07
IC37 93C46
I/O PORT
PS:
A0-CONT RY
A1-KO3
A2-VS
A3-BZ
A4-HV-LED
A5-PASS
A6-FAIL
A7-OC
C4-KO1
C5-KO2
P1.0-CS
P1.1-SK/ADCH
P1.2-DI
P1.3-AMP-RY
P1.4-ON
P1.5-KI1
P1.6-KI2
P1.7-KI3
RXD-CONT IN
TXD-A/D
INT0-RESET
INT1-OFL
T0-DI
T1-AC
FILE: S375921C.DWG
ASSOCIATED RESEARCH, INC.
USED ON MODEL/ASSY
3500D 3560D
SCHEMATIC
MAIN CONTROL BOARD
CW7120
DRAWN CPY 10.27.95
CHECKED NLT 11.15.95
APPROVED RB 11.15.95
SIZE A
S37592
REV C
SCALE NONE
SHEET 1 OF 5

REVISIONS					
SYM	DESCRIPTION	ECO#	DATE	APPR	CHK





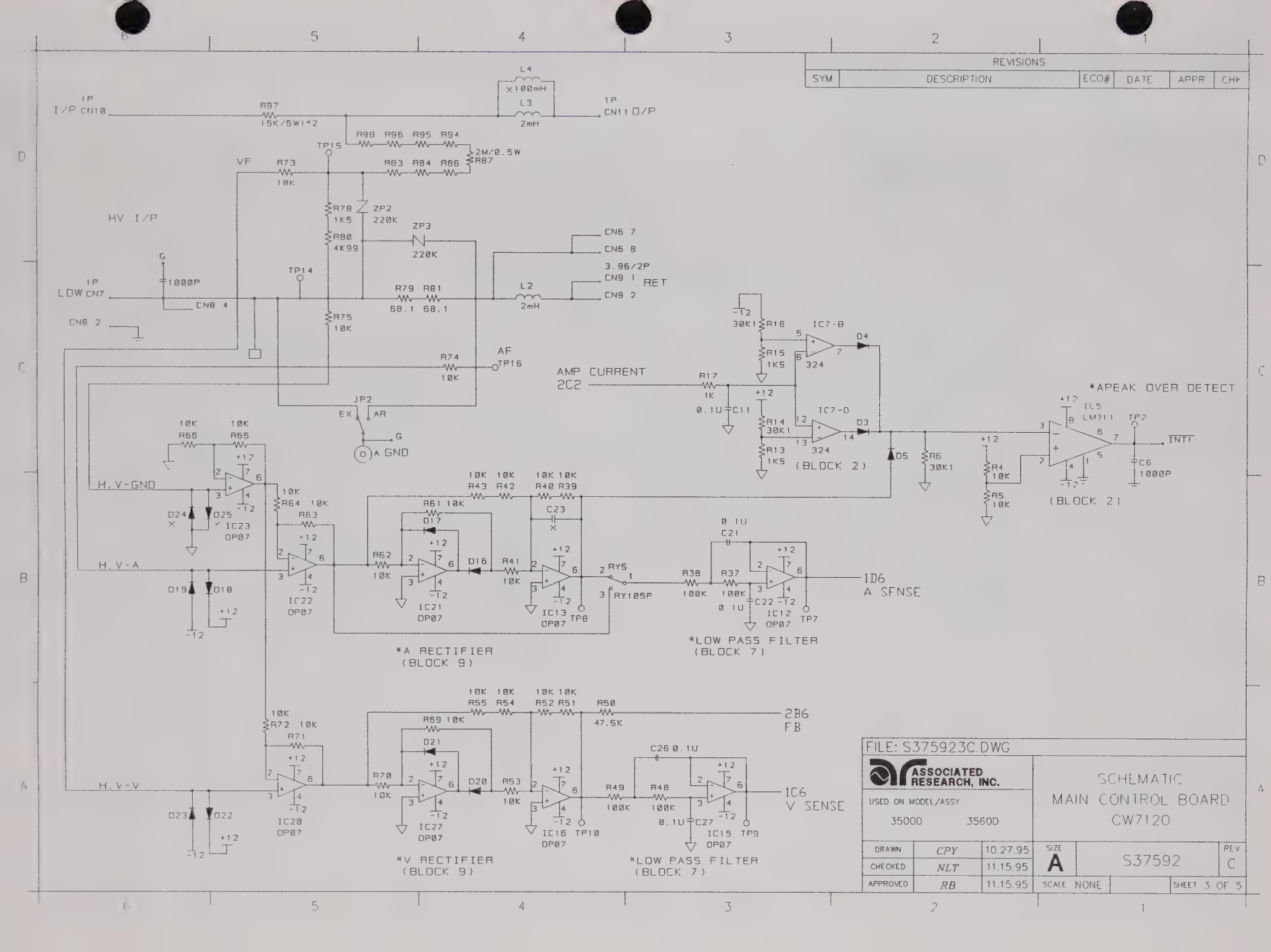
FILE: S375922C DWG

ASSOCIATED RESEARCH, INC.

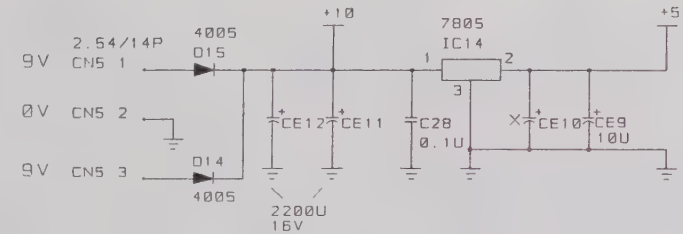
USED ON MODEL/ASSY
3500D 3560D

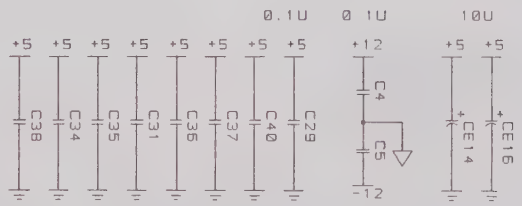
SCHEMATIC
MAIN CONTROL BOARD
CW7120

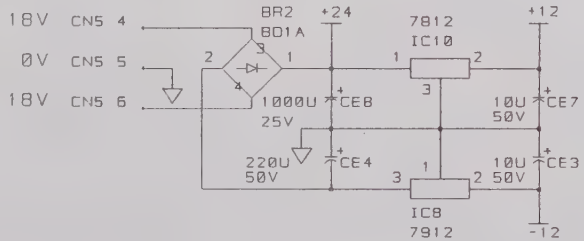
DRAWN	CPY	10.27.95	SIZE A	S37592	REV C
CHECKED	NLT	11.15.95			
APPROVED	RB	11.15.95	SCALE NONE		SHEET 2 OF 5

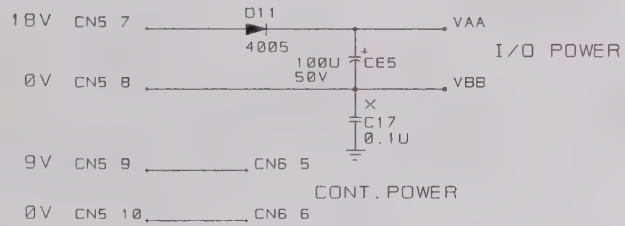

REVISIONS
SYM | DESCRIPTION | ECO# | DATE | APPR | CHK
1P I/P CN10
R97 (5K/5W)*2
L4 ×100mH
L3 2mH
1P CN11 O/P
R98 R96 R95 R94
2M/0.5W R87
R83 R84 R86
TP15
VF
R73 10K
HV I/P
R78 1K5
ZP2 220K
R80 4K99
ZP3 220K
CN6 7
CN6 8
3.96/2P
CN9 1 RET
CN9 2
G
1000P
TP14
1P LOW CN7
CN8 4
CN6 2
R79 R81 68.1 68.1
L2 2mH
R75 10K
R74 10K
AF TP15
JP2 EX AR
G
A GND
AMP CURRENT 2C2
R17 1K
0.1U C11
-12 30K1 R16
IC7-B
D4
R15 1K5
324
+12
R14 30K1
IC7-D
D3
R13 1K5
324
(BLOCK 2)
D5
R6 30K1
*APEAK OVER DETECT
IC5 LM311
TP2
INT1
R4 10K
R5 10K
C6 1000P
(BLOCK 2)
10K R66
10K R65
H.V-GND
D24
D25
IC23 OP07
10K R64
10K R63
H.V-A
D19
D18
IC22 OP07
10K R43
10K R42
10K R40
10K R39
R61 10K
D17
C23
R62 10K
D16
R41 10K
IC21 OP07
IC13 OP07
TP8
RY5
RY105P
0.1U C21
R38 100K
R37 100K
0.1U C22
IC12 OP07
TP7
1D6 A SENSE
*A RECTIFIER (BLOCK 9)
*LOW PASS FILTER (BLOCK 7)
10K R72
10K R71
H.V-V
D23
D22
IC28 OP07
10K R55
10K R54
10K R52
10K R51
R50 47.5K
2B6 FB
R69 10K
D21
R70 10K
D20
R53 10K
IC27 OP07
IC15 OP07
TP10
C26 0.1U
R49 100K
R48 100K
0.1U C27
IC15 TP9
IC6 V SENSE
*V RECTIFIER (BLOCK 9)
*LOW PASS FILTER (BLOCK 7)
FILE: S375923C.DWG
ASSOCIATED RESEARCH, INC.
USED ON MODEL/ASSY
3500D 3560D
SCHEMATIC
MAIN CONTROL BOARD
CW7120
DRAWN CPY 10.27.95
CHECKED NLT 11.15.95
APPROVED RB 11.15.95
SIZE A
S37592
REV C
SCALE NONE
SHEET 3 OF 5

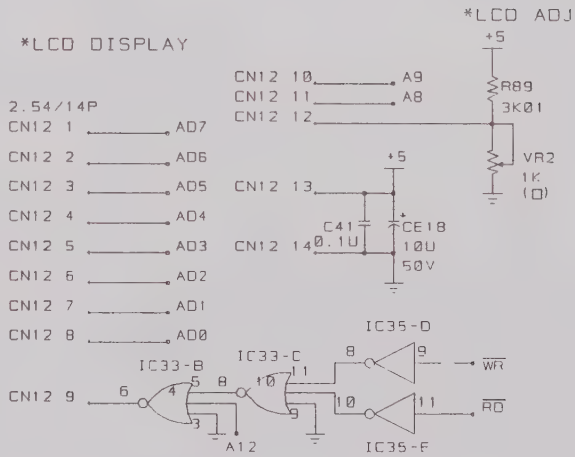
REVISIONS					
SYM	DESCRIPTION	ECO#	DATE	APPR	CHK











CONNECTOR
CN1 I/P 9P D-TYPE
CN5 POWER 2.54/14P
CN8 DC OPTION 2.54/4P
CN13 PANEL 16P(< >)
CN12 LCD 2.54/14P
CN4 AMP O/P 3.96/2P
CN6 CONT

FILE: S375924C.DWG

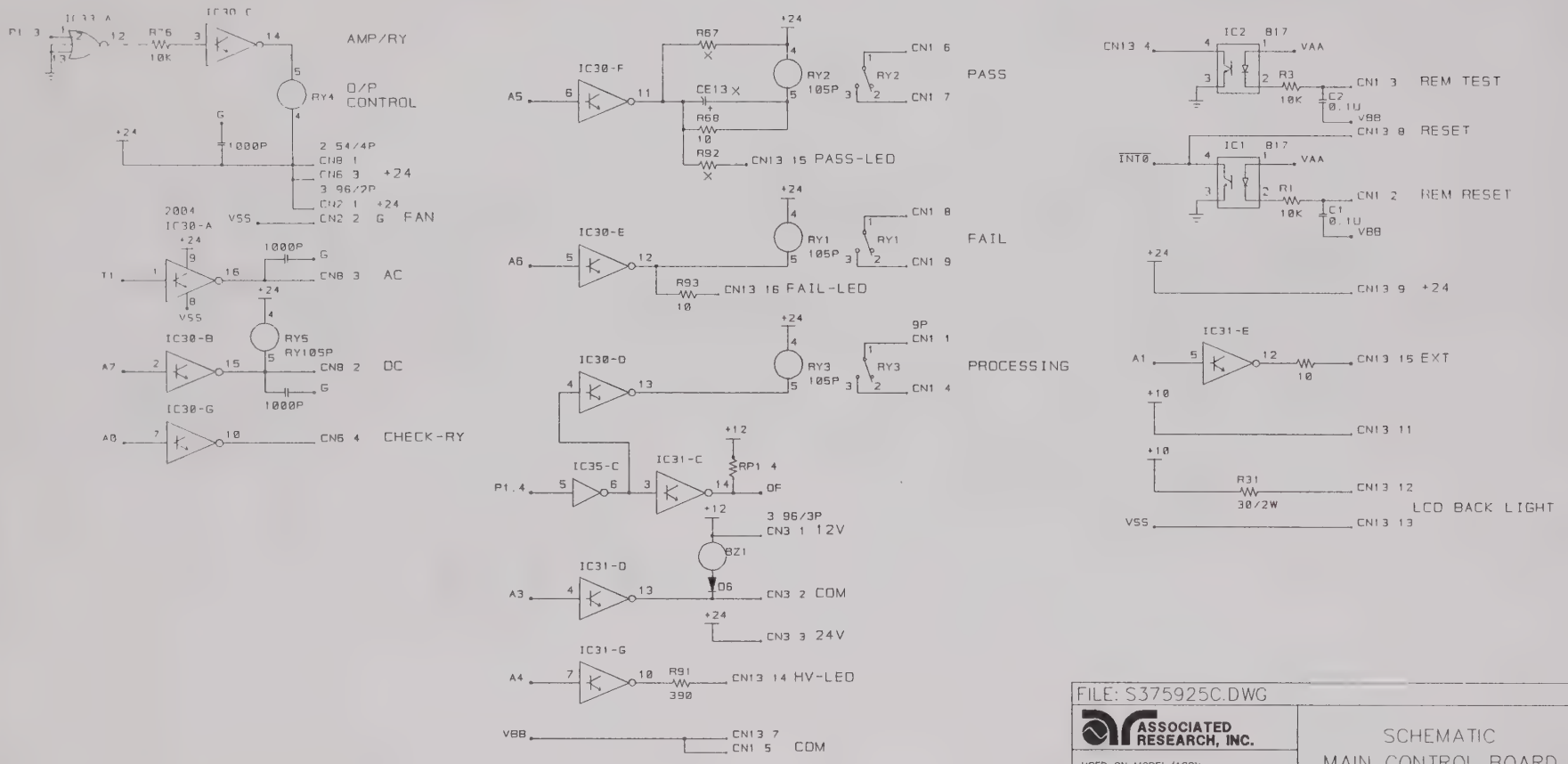
ASSOCIATED RESEARCH, INC.

USED ON MODEL/ASSY: 3500D 3560D

SCHEMATIC
MAIN CONTROL BOARD
CW7120

DRAWN	CPY	10.27.95	SIZE A	S37592	REV C
CHECKED	NLT	11.15.95			
APPROVED	RB	11.15.95	SCALE NONE		SHEET 4 OF 5

REVISIONS					
SYM	DESCRIPTION	ECO#	DATE	APPR	CHK
A	R17 WAS 4.99k	4601 4602	12 15 95	RB	NLT
B	R17 WAS 10ohm.	4631	08 28 96	RB	NLT
C	R50 WAS 100K	4632	08 28 96	RB	NLT



FILE: S375925C.DWG

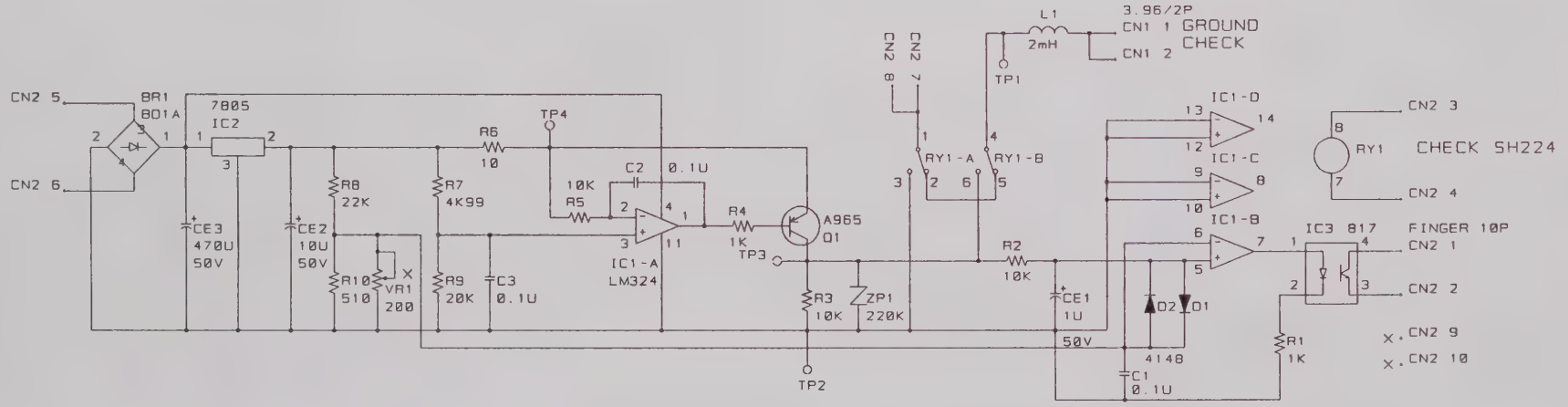
ASSOCIATED RESEARCH, INC.

USED ON MODEL/ASSY
3500D 3560D

SCHEMATIC
MAIN CONTROL BOARD
CW7120

DRAWN	CPY	10.27.95	SIZE	S37592	REV
CHECKED	NLT	11.15.95	A		C
APPROVED	RB	11.15.95	SCALE NONE		SHEET 5 OF 5

REVISIONS					
SYM	DESCRIPTION	ECO#	DATE	APPR	CHK
A	ADDED C4 0.001U AND REDRAWN.	4591	10.11.95	*RB*	*NLT*
B	REVISED PCB FROM CGC-01 TO CGC-01A, ADDED L1 AND REDRAWN.	4592	11.15.95	*KS*	*NLT*



FILE: S37548B.DWG

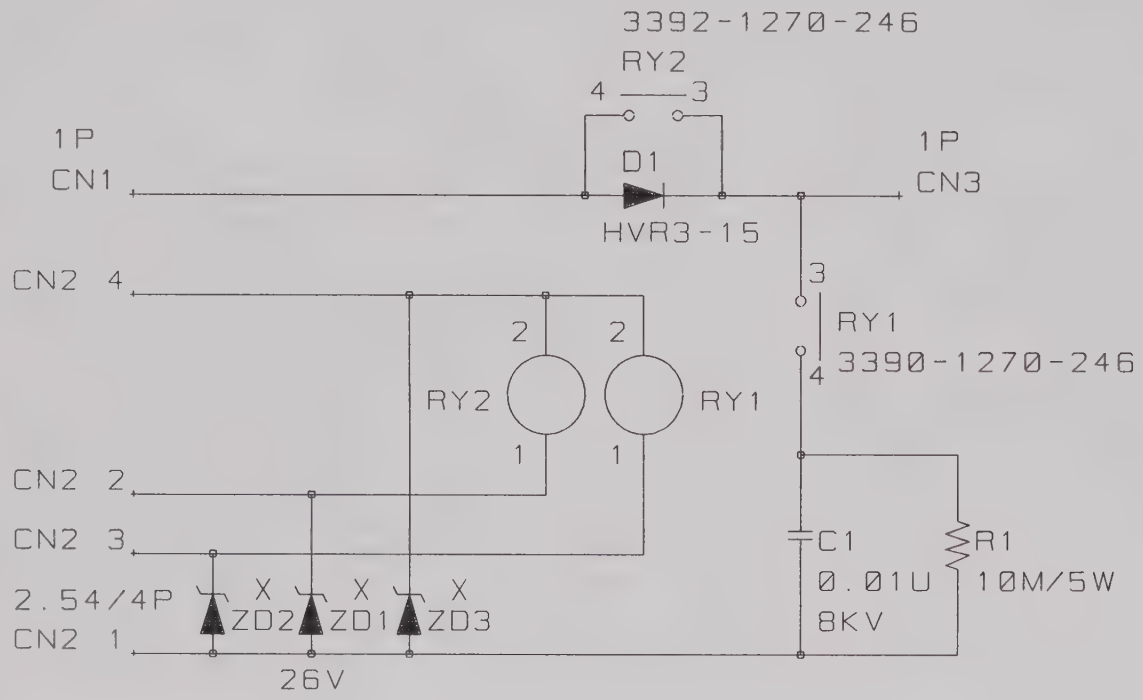
ASSOCIATED RESEARCH, INC.

USED ON MODEL/ASSY
3500D 3560D

SCHEMATIC
GND. CONT. CHK. BOARD
CGC-01A

DRAWN	*CPY*	08.21.95	SIZE A	S37548	REV B
CHECKED	*NLT*	11.15.95			
APPROVED	*RB*	11.15.95	SCALE NONE		SHEET 1 OF 1

REVISIONS					
SYM	DESCRIPTION	ECO#	DATE	APPR	CHK



FILE: S37590.DWG

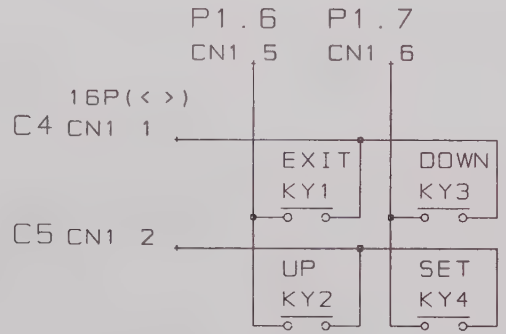
ASSOCIATED RESEARCH, INC.

USED ON MODEL/ASSY
3500D 3560D

SCHEMATIC
PCB HV CONTROL AC/DC
CHV-04A

DRAWN	CPY	08.31.95	SIZE	S37590	REV
CHECKED	NLT	11.15.95	A		–
APPROVED	[illegible]	11-15-95	SCALE NONE		SHEET 1 OF 1

REVISIONS					
SYM	DESCRIPTION	ECO#	DATE	APPR	CHK



2.54/12P

CN2 1	CN1 11	+10V
CN2 2	CN1 14	HV-LED
CN2 3	CN1 12	+ LCD BACK LIGHT
CN2 4	CN1 13	- LCD BACK LIGHT
CN2 5	CN1 8	INT0 RESET
CN2 6	CN1 13	G RESET
CN2 7	CN1 4	P1.5 TEST
CN2 8	CN1 13	G TEST
CN2 9	CN1 9	+24
CN2 10	CN1 16	FAIL LAMP
CN2 11	CN1 9	+24
CN2 12	CN1 15	PASS LAMP

CN1 10 X

FILE: S37593.DWG

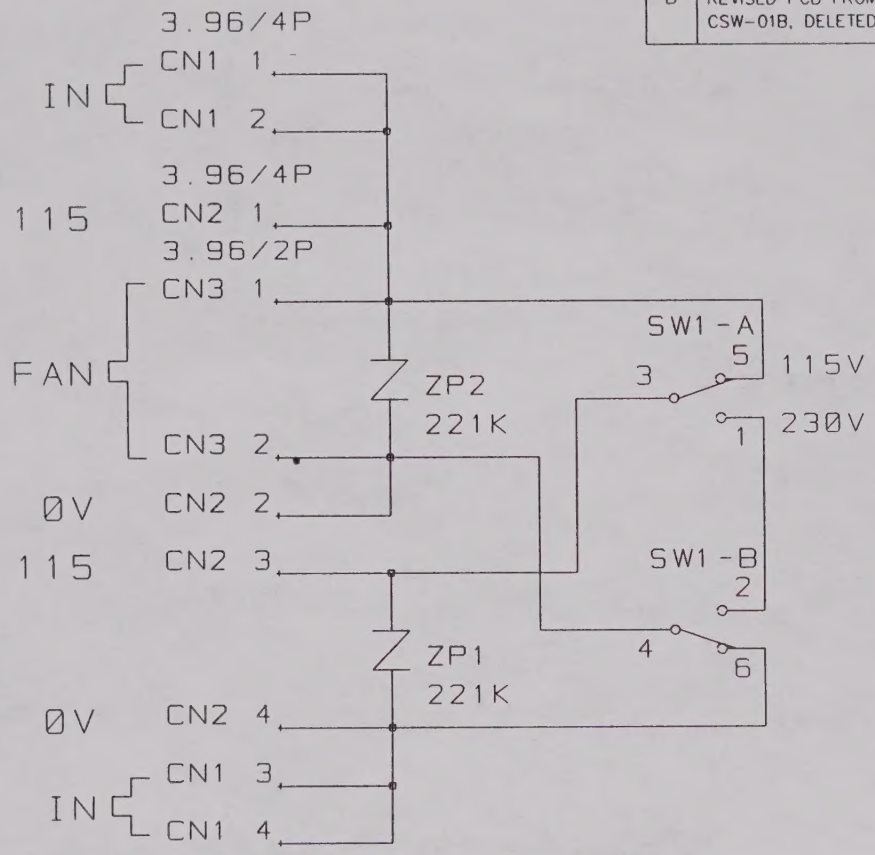
ASSOCIATED RESEARCH, INC.

USED ON MODEL/ASSY
3500D 3560D

SCHEMATIC
PCB KEYPAD
CKB-02

DRAWN	CPY	08.24.95	SIZE A	S37593	REV -
CHECKED	NLT	11-15-95			
APPROVED	RB	11 15 95	SCALE NONE		SHEET 1 OF 1

REVISIONS					
SYM	DESCRIPTION	ECO#	DATE	APPR	CHK
A	REVISED PCB FROM CSW-01 TO CSW-01A. SCHEMATIC UNCHANGED.	–	10.03.95	RB	NLT
B	REVISED PCB FROM CSW-01A TO CSW-01B, DELETED C1 AND REDRAWN.	4592	11.15.95	RB	NLT



FILE: S37515B.DWG

ASSOCIATED RESEARCH, INC.

USED ON MODEL/ASSY
3500D 3560D

SCHEMATIC
INPUT PROTECTION PCB
CSW-01B

DRAWN	CPY	06.16.95	SIZE A	S37515	REV B
CHECKED	NLT	11.15.95			
APPROVED	RB	11.15.95	SCALE NONE		SHEET 1 OF 1

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